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Soil Survey of Lee County, Georgia

By

J. W. MOON

Bureau of Chemistry and Soils

In Cooperation with the Georgia State College of Agriculture

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SOIL SURVEY OF LEE COUNTY, GEORGIA

By J. W. Moon

COUNTY SURVEYED

Lee County is in the southwestern part of Georgia. Flint River forms the eastern boundary and Kinchafoonee Creek a part of the western boundary. Other boundary lines are straight. The county is roughly rectangular in shape, its maximum north-and-south dimension being about 20 miles and the maximum east-and-west dimension about 24 miles. The land area of the county is 358 square miles, or 229,120 acres.

Physiographically Lee County is located in that division of the coastal plain designated as the Dougherty Plain [1] which is characterized by a mild relief, few small surface streams, and numerous limestone sinks forming depressions in an otherwise very smooth plain. The range in elevation is slightly less than 125 feet and the general slope is from northwest to southeast. One of the highest points in the county is Smithville, in the northwest part, where the elevation above sea level (according to information given by the chief engineer of the Central of Georgia Railway) is 341 feet. Elevations along the south county line range from about 225 to 250 feet. The physiographic divisions include gently rolling uplands, undulating upland plains, and low-lying plains, part of which are well drained and part of which are wet and swampy.

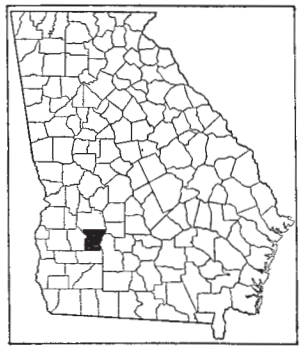

Figure 1.—Sketch map showing location of Lee County, Ga.

The part of the county west of the Central of Georgia Railway is drained by Kinchafoonee Creek and the central part is drained by Muckalee Creek. The eastern and northern parts are drained by Flint River through Chokee Creek and other and smaller tributaries. A number of subterranean streams reach the surface and form large springs. Several of these subterranean streams flow on the surface for part of their course and underground the rest of the way, changing four or five times within the county.

Probably in 75 per cent of the county natural drainage is adequate for cultivation. A large proportion of the poorly drained soils is well suited to pasture grasses. Practically all the land would support a heavy timber cover. An area lying along the Central of

[1] Veatch, O., and Stephenson, L. W. Preliminary report on the geology of the coastal plain of Georgia. Ga. Geol. Survey Bul. 26, 466 p., illus. 1911.

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Georgia Railway between Leesburg and Smithville and another lying west and northwest of Philema, the two comprising about 50 square miles of flat land, would be materially benefited by artificial drainage. In some of the more progressive communities artificial drainage is being resorted to. The larger streams have ample fall to make possible the draining of the broad swamps through which they flow by straightening and dredging the stream beds.

Springs are numerous over the county, especially along the larger streams and at the heads of the smaller tributaries where the underlying limestone is exposed. These springs furnish water not only for livestock but also for home use. Surface wells are still common, although the number of deep-bored wells is increasing. A number of flowing wells, most of them less than a mile from Flint River, were seen. The flowing and deep-bored wells furnish the most wholesome water.

Lee County was organized in 1826 from lands acquired from the Creek Indians at the last treaty of Indian Springs. It was named for "Light-Horse Harry" Lee, father of Robert E. Lee. At that time it included what is now Terrell, Randolph, Quitman, Schley, Stewart, Sumter, and Webster Counties and part of the present Chattahoochee, Clay, and Marion Counties. The county seat was originally located at Starksville, 3 miles northeast of Leesburg, the present county seat. It was moved to Leesburg in 1872, just after the Central of Georgia Railway had been extended through the county. Early settlements were made in the vicinities of Starksville, Palmyra Springs, and Smithville. The early settlers were native-born Americans of Anglo-Saxon stock, coming mostly from the Carolinas, Tennessee, and Virginia. The present white inhabitants are largely either descendants of the early settlers or later comers from the same States and from the northern part of Georgia.

The population, according to the 1920 census, is 10,904, all of which is classed as rural. The average density of the population is 33.4 persons to the square mile. The central part of the county, the north-central part, and the vicinities of towns are the most thickly settled. A belt lying along Flint River, in the extreme eastern part, is the most sparsely settled region.

Leesburg, a modern town with a population of 786 in 1920, is centrally located and affords a trading point for the surrounding country. Smithville, in the northwestern part of the county, is surrounded by a prosperous agricultural community which it serves as a trading and shipping point. Albany, which is 10 miles south of Leesburg, in Dougherty County, offers a local market for much of the southern half of the county for surplus truck crops, poultry, and dairy products offered by the farmers of this section.

Macon, Atlanta, and Columbus, and Jacksonville, Fla., are among the principal outside markets.

Lee County is well served by railroads, very few places being more than 5 miles from a line and no place more than 8 miles. Lines of the Central of Georgia Railway, the Seaboard Air Line Railway, and the Georgia Southwestern & Gulf Railroad run through the county. Most of the county roads are of sand-clay material and are kept in good condition throughout practically all seasons of the year. Two main highways, one paralleling the Cen-

tral of Georgia Railway through Smithville and Leesburg to Albany and another across the southwestern part of the county, carry much of the traffic across the State to Florida.

CLIMATE

The climate of Lee County is typical of the lower coastal plain. Summers are long and warm and winters short and mild. The humidity is fairly low and evaporation is correspondingly high. The rainfall is moderately heavy and is well distributed throughout the year, being heaviest during the growing season and lightest during fall.

At times the heat becomes somewhat oppressive, but the nights are usually tempered by cooling Gulf breezes. The temperature during winter rarely falls to freezing. The cold snaps are of short duration and are usually followed by several warm, balmy days. The typical weather cycle during the winter consists of a cold period lasting two or three days, followed by several warm days ending in rain, after which cold weather returns. Snow seldom falls.

The average annual frost-free season extends over a period of about eight months, the average date of the latest killing frost being March 13 and of the earliest November 15. Frosts have been recorded, however, as late as April 26 and as early as October 21. Such unseasonable frosts are of very rare occurrence and the loss of fruit, vegetables, or general field crops from this source is negligible.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Albany, Dougherty County*

[Elevation, 230 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1896)	Total amount for the wettest year (1928)
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*
December	51.3	84	12	3.79	1.78	3.04
January	50.2	83	11	4.07	3.66	2.33
February	52.0	88	−2	5.01	8.99	7.80
Winter	51.2	88	−2	12.87	14.43	13.17
March	60.5	93	23	4.72	4.68	5.78
April	66.8	98	32	3.58	.40	12.96
May	74.5	100	40	3.90	2.14	1.48
Spring	67.3	100	23	12.20	7.22	20.22
June	80.8	105	48	4.42	1.85	7.79
July	82.1	104	60	6.16	7.66	4.02
August	81.6	102	61	5.57	2.00	7.98
Summer	81.5	105	48	16.15	11.51	19.79
September	78.0	100	45	3.22	2.43	9.67
October	67.8	98	32	2.46	2.10	1.27
November	57.9	89	20	2.34	2.18	.81
Fall	67.9	100	20	8.02	6.71	11.75
Year	67.0	105	−2	49.24	39.87	64.93

The open winters render expensive shelters for livestock unnecessary. Permanent pastures can be grazed from 9 to 12 months during the year, depending on the severity of the winter and nature of the pasture.

Climatic conditions are such that several crops, including both field crops and vegetables, may be grown during winter. Oats, rye, wheat, vetch, clover, and winter field peas are among the winter field crops, and such vegetables as turnips, collards, and other greens, onions, cabbage, and lettuce are common winter truck crops. Early spring plantings of corn, peas, beans, potatoes, tomatoes, squash, and other less hardy vegetables are made with little danger of frost injury.

The data set forth in Table 1, giving the normal monthly, seasonal, and annual temperature and precipitation at Albany, 3 miles south of the southern boundary of Lee County, are fairly representative of climatic conditions prevailing throughout the county.

AGRICULTURE

The territory now included in Lee County originally supported a heavy growth of yellow pine, with small numbers of oaks, hickory, gums, cypress, beech, swamp maple, bay, and magnolias.

Prior to the coming of white settlers the Creek Indians had established one of the largest towns of their tribe about 4 miles northeast of Leesburg, immediately east of Starksville Bridge. Pioneer whites began making settlements here slightly more than a century ago, concerning themselves, as most pioneer farmers of America did, with the production of subsistence crops. The story of the growth and development of pioneer agriculture in Lee County is essentially that of all southwestern Georgia. Agriculture developed along with the turpentine and lumbering industries. The extension of railroads through this section of the State greatly stimulated the development of these industries. Practically all the original stand of yellow pine has long since been removed and the greater part of the well-drained lands of the county was put under cultivation more than 40 years ago. Second-growth pines of merchantable size which have grown up on a few comparatively small areas since the removal of the original cover, scattered pines in the stream swamps, and some of the hardwoods are rapidly being removed. Lumbering and logging are still rather important industries. Turpentine is also a source of considerable income, and longleaf and slash pines are being boxed over large areas in the central and eastern parts of the county where light-textured poorly or moderately drained soils predominate.

Immediately after the Civil War cotton, grown principally by cheap labor under the supervision of large landowners, became the one cash crop and the chief source of income for Lee County. For the last 60 years all phases of economic development have centered around the production of this crop. For more than half a century cotton was grown extensively and universally with the result that, crop rotation and diversification being ignored, many of the soils became impoverished and the greater part of the work animals, feed, and foodstuffs were imported. This 1-crop system prevailed until the advent of the boll weevil about 10 years ago. The invasion

of this pest resulted in several disastrous cotton-crop failures, the exodus of many negro laborers from the farms, and a period of severe agricultural depression. The severe attack of the weevil marked the beginning of a new agricultural era for this entire section of the country. Although cotton is still one of the principal cash crops, its acreage has been materially reduced, and peanut growing, hog raising, and pecan growing have come into prominence as sources of income. The smaller acreage of cotton now being produced under boll-weevil conditions requires more intelligent soil and crop management than formerly prevailed. More diversification of crops, incident to the reduction of the cotton acreage and the corresponding increase in the acreage devoted to peanuts, grains, hays, and other feedstuffs, is now common throughout the county, although no perfect or systematic scheme of crop rotation is yet generally practiced.

At present cotton, corn, and peanuts are the leading field crops, both in acreage and value. Cotton and corn have led in acreage since the Civil War. Peanuts have come into prominence during the last decade, the 1925 Federal census reporting 19,001 acres, with a production of 437,023 bushels in 1924.

Most of the more progressive farmers now plant nearly equal acreages to cotton and peanuts. Ample feed, not only that necessary for cattle and work animals on the farm but sufficient to fatten a good number of hogs for the market, is produced.

In 1919 cotton occupied 37,901 acres and produced slightly more than one-fifth bale to the acre. In 1924, although the acreage was only 6,612 acres, the average yield was one-third bale to the acre. Cleveland Big Boll and strains of Toole are the most popular varieties grown.

In 1919 corn was grown on 33,275 acres, with an average yield of slightly more than 10 bushels to the acre. Velvetbeans are grown in most of the corn and produce from one-half to 1 ton of beans to the acre. In 1924 corn for grain occupied 21,369 acres, and 234,162 bushels were produced.

Small acreages are sown to oats, rye, and wheat. Hay yields about 1 ton to the acre. Vetch, clover, winter field peas, soybeans, velvetbeans, and cowpeas are the legumes most commonly produced for hay. The velvetbeans are planted with the corn in the hill or between the corn rows.

A few farmers in the north-central part are making a specialty of tobacco, which is not widely grown in the county. A few commercial peach orchards are scattered through the county, and a few rather extensive plantings are in the southwestern part in the vicinity of Albany. Some pears are grown commercially, mainly in the vicinities of Leesburg and Smithville. Pecan orchards have been set out in nearly all parts of the county, many plantings comprising hundreds of acres. On most farms sweetpotatoes and sugarcane are planted for home needs only. Some sweetpotatoes and watermelons are grown for market.

Hogs are raised on practically all farms for home needs, and on many of the more progressive farms hogs furnish one of the principal sources of income. The so-called "pine rooters" have been replaced by purebred hogs and grades of such breeds as the Duroc-Jersey, Poland China, and Hampshire.

A few dairy farms are in operation in various parts of the county. Whole milk and a small amount of sour cream are sold in local markets. Grade cows, mainly Jerseys, crossed with other breeds, predominate in the herds. Bermuda, wild, and other grasses on the uplands and carpet grass on the lower lands, together with a few acres of Napier grass, afford excellent grazing from 9 to 12 months of the year. Only a small number of sheep, goats, and cattle are raised.

As yet the adaptation of the various soils to different crops is understood by most farmers in only a very general way. That cotton requires an adequately well-drained soil with a comparatively heavy subsoil, that depressions are best suited for pasture grasses, and that watermelons give good yields on rather light-textured soils are generally recognized. In Lee County the planting of peach orchards is restricted almost entirely to the red (Greenville) soils. A successful pecan orchard requires a productive soil. Tobacco is known to give the best returns when grown on the finer-textured Norfolk and Tifton soils, especially Norfolk loamy sand.

The cultural methods prevailing in Lee County are very much the same as those in general use throughout the southern coastal plain section of the country. Most of the small farms are equipped with rather light plows and tillage tools, and many of the larger and more up-to-date farms are fully or partly equipped with heavier and more modern implements such as grain drills, mowers, binders, and tractors with plow equipment. Only light implements are required on the sandy soils.

Pecan orchards are set out on a number of different soils, but the most successful orchards are on the heavier soils such as Greenville and Tifton sandy loams. Any soils of fair drainage which are fairly retentive of moisture, in good physical condition, and moderately fertile and productive are recommended for pecan trees. Stuart and Schley are by far the most popular varieties of pecans grown.

Although no definite crop rotations are in general use, many of the more progressive farmers diversify their crops more or less consistently. Some farmers use the following rotation: First year, peanuts; second year, corn interplanted with beans or peas; third year, cotton; and fourth year, peanuts again. Small grains sometimes follow corn and beans. The grain crop may be succeeded by a summer hay crop of cowpeas. A very few farmers are beginning to use Austrian winter field peas or vetch as winter cover crops. This practice should be more general, as it tends to prevent erosion, adds much needed organic matter to the soils, and increases the supply of nitrogen, the most expensive and yet one of the most needed plant-food elements in Lee County.

According to the 1920 census report, $259,375 was spent in Lee County in 1919 for commercial fertilizers. Most of the fertilizer is applied to the cotton crop. Light applications are sometimes made under corn and some farmers make light applications of nitrate of soda on oats.

The exodus of tenant farmers, incident to the advent of the boll weevil, resulted in a scarcity of farm labor. The labor shortage is not so keenly felt at present, although the supply is by no means adequate. Farm wages usually range from $1 to $1.50 a day, depending on the nature of the work and the ability of the individual.

Individual land holdings range from a few acres to more than 10,000 acres. Probably 65 per cent of the land in the county is included in holdings ranging from 1,000 to 3,000 acres. Each tenancy is considered a farm in the census classification, and on this basis there were 1,691 farms in Lee County in 1920, averaging 101.7 acres in size. About 64.5 per cent of all the farm land is classed as improved.

According to the 1920 census, 84.4 per cent of the farms were operated by tenants and 14.1 per cent by owners. Farms are rented for cash, on a share basis, or for a stipulated amount of lint cotton. Under the share system, locally spoken of as the "cropping system," which is the most common, the owner supplies land, livestock, implements, and one-half the fertilizer, and the tenant furnishes all labor and one-half the fertilizer. The crop is divided equally.

Land prices range widely, according to location, improvements, and character of the soil. The undesirable lands command from $5 to $10 an acre and the range for land in fair condition is from $20 to $30. The price of pecan orchards ranges from $200 to $1,000 an acre.

SOILS

The soils of Lee County range in texture from loose, incoherent coarse quartz sands to clay loams. The sandy loams occupy more than 50 per cent of the area of the county, sands and loamy sands occupy the next largest acreage, and the clay loams are less extensive. Very little stony or gravelly land occurs. It is estimated that in about 25 per cent of the county drainage is inadequate for cultivation.

Except in those areas where, on account of poor drainage, organic matter has accumulated, the soils are light in color owing to a very low content of organic matter and the heavily leached condition of the surface layer. The prevailing mild temperature and high rainfall, together with the influence of the original heavy timber cover, have been important agents in preventing the accumulation and humidification of organic matter and at least in part account for the pronounced leached character of the soils. As is characteristic of soils developed under such conditions, the normal mature textural profile shows a comparatively light or highly eluvial surface soil, the A horizon, underlain by a rather heavy illuvial zone, the subsoil or B horizon, which is in turn underlain by imperfectly weathered material, the C horizon, which is in most places somewhat lighter in texture than the subsoil but in nearly all places is heavier than the surface soil. The horizons range widely, however, in thickness, texture, and consistence.

The accompanying soil map shows the general distribution of the dominant soils of Lee County. The Greenville soils predominate in the extreme western and southwestern parts. The lighter-textured members of the Norfolk series are predominant in the southeastern part, and, together with the light-textured red soils, extend northward along the eastern county line. The Tifton soils predominate in the north-central part of the county. The distribution of the soils probably bears some relationship to topographic and drainage conditions as well as to variations in the nature and composition of the parent geologic material. The rate of leaching, together with

erosion and deposition of material washed from the surface soil, and the action of both surface and subterranean streams have influenced the soils. Flint River has contributed to the development of a very sandy belt from nearly 1 to 3 miles in width along its course. This belt of sand, at least in part, probably consists of material deposited by the river, although it now occupies a position in many places equal to and in some places even higher than the land several miles back from the river. Under prevailing climatic conditions, with high rainfall and only rare freezing temperatures, the soils of this sandy belt have been subjected to a long-continued process of severe leaching. The terrace formation of this belt has been largely obscured by subsequent surface modification effected largely by erosion, and by the underground solution of the Vicksburg limestone. A relationship exists between the larger streams and the development of these light-textured soil belts paralleling their channels.

Underlying practically all the soils of the county is the Vicksburg formation, which consists of soft white or cream-colored earthy or hard white crystalline or siliceous limestone, sands, and clays. The greater part of the limestone has been silicified and the material contains embedded flinty fragments and larger siliceous bowlders which may be seen here and there on the surface. Outcrops of this limestone have been observed in many parts of the county, especially along Flint River. Other exposures occur on the bluffs of Fowltown Creek near Armena, along Kinchafoonee Creek, and in limestone sinks in the southwestern part of the county. The overlying soils may be influenced by the limestone bedrock. In the southwestern part of the county where it seems that the limestone bedrock, unleached of its carbonate, occurs closer to the surface than in other parts of the county, the Greenville soils occupy probably 80 per cent of the area.

Over the greater part of the county, notably in the west-central part, a noticeable relationship exists between drainage conditions and the color of the soils, especially of the B horizon. Many of the soils on flat land are grayish and yellowish, whereas the scattered knolls, crests of ridges, and many narrow strips bordering the deeper drainage channels and some of the deeper limestone sinks are characterized by yellowish-red or red subsoils. In the more eroded and dissected part of the plain composed of Tifton soils in the north-central and northeastern parts of the county the steeper slopes and narrow strips adjacent to the deeper drainage channels have redder subsoils and many of them are correlated as Orangeburg and Ruston sandy loams.

Smooth rounded hard brown or almost black iron-oxide pebbles about the size of buckshot occur in nearly all well-drained soils of moderate or heavy texture. In some places they are very scattered, in others they may constitute more than 20 per cent of the soil mass, being so thickly strewn over the surface that a general brown appearance is produced. A high content of these concretionary pebbles is a characteristic feature of the Tifton soils and of the pebbly phase of Greenville clay loam.

The soils of Lee County may be classified in two groups on the basis of profile development or degree of maturity. The first group,

representing the most mature or normally developed soils, includes members of the Greenville, Tifton, Orangeburg, Norfolk, Blakely, Cahaba, Kalmia, and Ruston series. These soils occupy probably 75 per cent of the area of the county and are characterized by the typical or normally developed textural profile previously described.

This group may be subdivided into two subgroups on the basis of the general features of the color profile. The first subgroup, including soils of the Tifton, Norfolk, Ruston, Cahaba, and Kalmia series, is marked by a profile in the virgin soils as follows: (1) A grayish light-textured surface layer more or less mixed with the surface veneer of largely unhumidified organic matter and ranging in thickness from 1 to 3 inches, usually being thicker in the sandier soils; (2) a pale-yellow or grayish-yellow light-textured layer which is extremely low in organic matter, loose and single grained in structure, exhibiting evidences of strong leaching, and ranging in thickness from less than 1 to more than 2 feet in the sandier soils and together with the first layer forming the comparatively light-textured surface soil or horizon A; (3) horizon B, a yellow or reddish-yellow layer containing a maximum quantity of fine materials and differing considerably in thickness and in color in different soils, the color in the Ruston and Cahaba soils being somewhat more reddish; and (4) mottled reddish, grayish, yellowish, or whitish imperfectly weathered material corresponding to the material in the C horizon. The proportion of the different-colored mottles varies as do the texture and consistence. This material is in nearly all places highly mottled, more or less compact, and lighter in texture than the subsoil but heavier than the surface soil.

The second subgroup of soils differentiated on the basis of the color of the several layers includes the members of the Greenville, Orangeburg, Blakely, and Amite series. These soils are characterized by the conspicuous red color of the comparatively heavy layers or B horizons. The A horizons, or surface soils, of the Greenville and Blakely soils show reddish-brown or reddish colors and those of the Orangeburg soils have grayish-brown surface layers which grade into brownish-yellow subsurface layers. With the exception of color differences in the weathered profile, characteristics of this subgroup, including texture, structure, and consistence, appear to be, at least roughly, similar to those of the first subgroup. The red soils of this subgroup probably contain a slightly larger proportion of fine materials, show more reddish colors, and contain more soft iron concretions in the parent material.

In addition to the group of soils characterized by normally well-developed profiles there is a second group including soils in which normal development has been prevented by imperfect drainage or stream action. This group of comparatively immature soils includes members of the Grady, Plummer, and Congaree series. The aggregate area occupied by soils of this group is small.

The Grady and Plummer soils are immature, owing primarily to poor drainage conditions and lack of aeration. The surface layers are high in organic matter and are commonly very dark colored. The subsoils of the Grady soils are not uniform in color but are imperfectly oxidized, mottled, rather tough and plastic heavy more

or less impervious sandy clay, and the Plummer soils consist largely of sand to a depth of several feet.

The various soils of Lee County are grouped in series on the basis of such general characteristics as color, structure, and consistence. The series are divided into soil types on the basis of textural differences. Twenty-two soil types and four phases of types, representing 13 soil series, together with the miscellaneous classification, swamp, are mapped.

Soils of the Greenville series are characterized by brown or red surface soils and red heavy stiff sandy clay or loose loamy sand subsoils. Iron-oxide concretions are not uncommon in the medium or heavy-textured members. The sandy loam, clay loam with a pebbly phase, loamy sand, and loamy coarse sand members of the Greenville series are mapped.

The Tifton series includes soils having brownish-gray surface layers, dull-yellowish subsurface layers, and yellow sandy clay subsoils. Iron-oxide concretions are numerous throughout all the weathered layers and are scattered over the surface. Tifton sandy loam with deep and flat phases is mapped.

The soils of the Orangeburg series are characterized by gray or light-brown surface layers, yellow or brownish-yellow subsurface layers, and bright-red friable and crumbly sandy clay or loamy sand subsoils. Orangeburg sandy loam and Orangeburg loamy sand occur in Lee County.

Soils of the Norfolk series have grayish surface layers, dull yellowish subsurface layers, and yellow friable and crumbly sandy clay or lighter-textured subsoils. The sandy loam, with a deep phase, loamy sand, sand, and coarse sand members of the Norfolk series are mapped.

The Blakely soils occur in close association with the Greenville soils but differ from them in having dark-brown or dark reddish-brown surface soils and dark-red or maroon-red firm rather stiff smooth clay subsoils which contain a few small black concretionary specks. The Blakely soils show strong effervescence with a 15 per cent solution of hydrogen peroxide. Blakely clay loam is mapped.

The surface layers of the Ruston soils are gray or grayish brown, the subsurface layers are yellowish or brownish yellow, and the subsoils are reddish-yellow, yellowish-red, or brownish friable crumbly sandy clay or lighter-textured material. Many iron pebbles occur in the sandy loam soil. Ruston sandy loam and Ruston loamy sand are mapped.

The soils of the Grady series are characterized by dark-gray surface layers and drab or bluish-gray heavy, sticky clay or sandy clay subsoils mottled with yellow, red, and brown. These soils occupy limestone sinks and are naturally poorly drained. The sandy loam and clay loam members of the Grady series are mapped.

Soils of the Plummer series consist of gray sandy surface soils underlain by whitish-gray sandy material, which is in turn underlain by grayish water-logged sand containing yellowish or brownish streaks or mottles. Only Plummer sand is mapped.

The Cuthbert soils are characterized by grayish surface soils and varicolored stiff, heavy, impervious subsoils. Only the sandy loam is mapped.

The Kalmia, Cahaba, and Amite soils occupy the terraces or second-bottom lands along the larger streams. The fine sandy loams of the Cahaba and Amite series and the loamy fine sand of the Kalmia series are mapped.

The Congaree soils occupy first-bottom lands where alterations in the soil materials incident to overflow are many and varied. Congaree silty clay loam is mapped.

Swamp, a miscellaneous material, includes the permanently wet lands along the streams. This material has no profile development and varies so greatly that no type name could be assigned to it.

In the following pages of this report the soils of Lee County are described in detail and their relation to agriculture is discussed; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in Table 2.

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Lee County, Ga.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Greenville sandy loam	28,736	12.5	Blakely clay loam	1,792	0.8
Greenville clay loam	5,504	5.9	Ruston sandy loam	2,304	1.0
Pebbly phase	7,936		Ruston loamy sand	6,976	3.1
Greenville loamy sand	6,784	3.0	Grady sandy loam	33,664	14.7
Greenville loamy coarse sand	1,152	.5	Grady clay loam	2,368	1.0
Tifton sandy loam	17,600	11.9	Plummer sand	3,136	1.4
Deep phase	3,392		Kalmia loamy fine sand	5,312	2.3
Flat phase	6,272		Cahaba fine sandy loam	1,920	.8
Orangeburg sandy loam	16,768	7.3	Amite fine sandy loam	320	.1
Orangeburg loamy sand	3,328	1.5	Congaree silty clay loam	1,152	.5
Norfolk sandy loam	11,840	8.4	Cuthbert sandy loam	256	.1
Deep phase	7,360		Swamp	20,032	8.7
Norfolk loamy sand	18,752	8.2			
Norfolk sand	10,368	4.5	Total	229,120	
Norfolk coarse sand	4,096	1.8			

GREENVILLE SANDY LOAM

In virgin areas the 2 or 3 inch surface layer of Greenville sandy loam is dark-brown mellow sandy loam. This grades into deep brownish-red sandy loam which continues to a depth ranging from 10 to 14 inches. A thin veneer of leaf mold covers the surface and the organic matter present accounts for the dark color of the 3-inch surface layer. The subsoil consists of heavy slightly compact red sandy clay or clay which is sticky when wet but hard and brittle when dry. This layer extends downward to a depth of 6 or 8 feet. The underlying material varies considerably from place to place in depth, texture, and color. It is mottled red, yellowish, purplish, and whitish, rather compact but brittle sandy clay. Under cultivation the surface soil consists of brown or reddish-brown sandy loam to a depth of 6 or 8 inches.

In a few places the subsoil, at a depth ranging from 2 to 3 feet, shows faint streaks or splotches of lighter colors and is somewhat lighter textured. On some knolls and slopes the surface soil is shallower and heavier than typical and at the base of the slopes the surface material is thicker. In most places Greenville sandy loam, like most of the heavier-textured upland soils of the county, has developed iron concretions in either or both the surface soil and subsoil. The proportion of pebbles ranges from very small to probably 25 per cent of the soil mass. Gravel symbols on the map indicate areas where pebbles are most abundant. In a few places, notably

along the border of the larger stream swamps, erosion has been very active and the underlying siliceous rock crops out. Such areas, where of sufficient extent, are indicated on the map by stone symbols.

Greenville sandy loam is an important soil both in area and agricultural value. It is extensive in the southwestern, extreme northwestern, and central parts of the county and is the predominant soil in that part of the northeastern quarter where Chokee Creek enters. Other areas are mapped throughout all the well-drained parts of the county.

The surface features are somewhat variable, but no areas are extremely flat or very hilly. Limestone sinks occur here and there throughout the soil. In the southwestern corner of the county where the largest areas of Greenville sandy loam occur, the relief is undulating, and in the northern half it is undulating or rolling. Land of this kind is well or excessively drained.

The original forest on this soil consisted of a dense cover of mixed pine and hardwoods. Chemical analyses show this to be one of the most fertile upland soils of this section of the country, and experiments and field observations bear this out. Under good management the land is easily tilled. It retains moisture fairly well and is well suited to all the general field crops and to many of the special crops grown in the county. Most of the commercial peach orchards are on this soil. The red soils are credited with producing peaches of better color than the gray or yellow soils. The most successful pecan orchards of the county, a few of them valued at $1,000 an acre, are planted on this and other soils of the Greenville series.

With fair management and normal seasons the following crop yields may be expected: Cotton, one-half bale to the acre; corn, interplanted with velvetbeans, from 20 to 25 bushels of corn and 1 ton of beans; oats, followed by a hay crop, 40 bushels of oats and 1 ton of leguminous hay; and peanuts, from one-third to two-thirds ton of nuts and 1 ton of peanut hay. Excellent yields of truck crops are obtained, although maturity is not quite so early as on the Tifton and Norfolk soils.

For maintaining and increasing the fertility and productiveness of this soil the more progressive farmers recommend diversification of crops, terracing where needed, the incorporation of more organic matter, and the growing of leguminous manure crops, especially vetch or winter field peas as a winter cover crop. Such management adopted as a persistent practice will reduce fertilizer bills and increase average crop yields from 50 to 75 per cent. The use of barnyard manure is highly recommended. Commercial fertilizers, in various quantities, are profitably applied, giving temporary stimulation to the land and materially increasing crop yields. High-grade complete fertilizers, many of them analyzing 4–10–4,[2] are apparently becoming popular for cotton.

GREENVILLE CLAY LOAM

The 2 or 3 inch surface layer of Greenville clay loam in wooded areas is dark-brown loam. It is underlain by reddish-brown clay loam which continues to a depth of about 6 inches. The subsoil is red heavy stiff sandy clay which extends to a depth ranging from

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

50 to 60 inches, at which depth it grades into yellowish-red stiff sandy clay faintly splotched with lighter colors. This layer is underlain by mottled grayish-white, yellow, purple, and red stiff sandy clay material which extends downward to a depth of several feet. A very thin layer of leaf mold covers the surface. In plowed fields the first two layers are thoroughly mixed and the surface soil to plow depth is reddish-brown or red clay loam.

On many eroded slopes the parent material is reached at a depth of not more than 3 feet from the surface. In several rather flat areas, as those east of Hollis Bridge, weathering has evidently extended to a depth of 8 feet. This soil is very closely associated with Greenville sandy loam, and small areas of the sandy soil with deeper surface soil were included, especially at the foot of slopes and in places where the gradation from the one soil into the other was almost imperceptible. Various quantities of pebbles occur throughout the soil mass and on the surface. Areas in which the pebbles are most abundant are mapped as a pebbly phase of Greenville clay loam.

Greenville clay loam is not an extensive soil. Most of it occurs in the southwestern quarter of the county, but small areas are scattered throughout all parts where the Greenville soils prevail. Some of the largest areas lie along Kinchafoonee Creek north of Hollis Bridge.

Areas are generally rolling, although a few scattered ones lie in undulating or nearly flat positions. Drainage is generally good and in many places is excessive, often being accompanied by active erosion.

Erosion and the physical condition of this soil offer the most difficult problems of soil management. The steepest hillsides should be devoted to timber and pasture, and the better areas should be adequately terraced, planted to leguminous cover crops where practical, and cropped in accordance with a definite rotation.

The range of crop adaptation is not so wide for the clay loam as for the sandy loam of this series, although practically all the general field crops are grown with varying, though usually fair, degrees of success.

Greenville clay loam, pebbly phase.—The surface soil and subsoil material of the pebbly phase of Greenville clay loam are essentially the same as in the typical soil. However, the pebbly soil, as its name implies, contains a large quantity of pebbles or iron concretions scattered over the surface and throughout the soil mass. The pebbles are small, ranging in diameter from one-eighth to 1 inch, brown or black rounded or disk-shaped iron concretions or accretions. Soil of this phase, which is closely associated with typical Greenville clay loam, occurs with few exceptions in the southwestern quarter of the county. Areas are in general smoother than the typical soil and erosion is less severe. Drainage is adequate.

Good yields of practically all the common field crops are obtained and orchards of both peaches and pecans are excellent. It is thought that the presence of numerous pebbles partly prevents loss of the surface soil through erosion, increases the rate of absorption of rainfall, and tends to make the soil somewhat looser in consistence. Aeration and the downward movement of ground water also are affected by the presence of the pebbles. This soil is cultivated with more ease than is the typical soil and crop yields are generally better.

GREENVILLE LOAMY SAND

In the virgin condition Greenville loamy sand has a veneer of leaf mold and a surface layer, 2 or 3 inches thick, of dark-gray light loamy sand grading into a subsurface layer of reddish-brown very light loamy sand which continues to a depth of about 18 inches. The subsoil of deep-red heavy loamy sand in most places extends to a depth of 7 or 8 feet and is underlain by the unweathered yellowish-brown light loamy sand parent material which is streaked and blotched with deep yellow and brown. In cultivated fields the surface layer, to a depth of 6 or 8 inches, loses its dark color, and on mixing the surface soil with a part of the subsurface layer a grayish-brown or yellowish-brown color is produced.

This soil is so intricately associated with Greenville sandy loam in many places, especially southeast of James Pond, west of Kinchafoonee Creek, and east of Muckalee Creek in the vicinity of Forrester Bridge where the texture of the subsoil is intermediate between loamy sand and sandy loam, that separation of these two soil types is impractical. The narrow strips of Greenville loamy sand skirting the foot of slopes usually differ from typical in that the loamy sand may be underlain at a depth ranging from 3 to 4 feet by sandy clay. In a very few places iron concretions have accumulated on this soil in sufficient quantities to justify their indication on the map by gravel symbols.

Greenville loamy sand occurs almost entirely in rather broad strips along the borders of the larger stream swamps, principally those of Kinchafoonee and Muckalee Creeks. Several areas, some of considerable size, are mapped near the mouth of Chokee Creek and farther south along the border of the Flint River lowlands.

Areas of this soil are in general undulating or nearly level, resembling an old high terrace. Surface drainage is good and subsurface drainage is free.

The pine and much of the hardwood constituting the original forest growth have been removed, and probably 90 per cent of the land has at one time been cleared, although a considerable acreage has since been abandoned on account of labor shortage.

The physical characteristics of this soil are such that cultivation is easy. It is probably inadvisable to use tractors, but all other modern equipment can be satisfactorily used.

It is difficult to make a definite statement as to the dependable productivity of this soil, as it is sensitive to seasonal conditions, either droughts or long rainy periods being very detrimental. Under normal seasonal conditions and with proper soil management, good yields of corn, small grains, leguminous hays, truck crops, peanuts, and watermelons are obtained. This soil seems little suited to cotton growing under boll-weevil conditions, but pecans do well.

GREENVILLE LOAMY COARSE SAND

Greenville loamy coarse sand differs from Greenville loamy sand mainly in that the sand grains found in the surface soil and subsoil are coarser textured. The subsoil, which begins at a depth of 18 or 20 inches, is red loamy coarse sand extending to a depth ranging from 6 to 9 feet. Below this is yellowish-brown or yellow loamy coarse sand.

This is a comparatively unimportant and inextensive soil. It occurs almost entirely in the southeastern part of the county. A few areas are mapped farther north along Flint River.

The loamy coarse sand is slightly less productive than the loamy sand member of the Greenville series. Owing to the coarse texture of this soil, it absorbs practically all the rainfall, and as it dries out quickly it suffers severely during dry weather. This soil is subjected to more thorough leaching than is the loamy sand and consequently is slightly lower in content of water-soluble plant-food materials.

Most of the land of this kind has been cleared and put into cultivation, but entire fields have been abandoned since the coming of the boll weevil. The problems of soil management are very similar to those on the loamy sand of the Greenville series, perhaps slightly more difficult. Crop yields are slightly less than on the loamy sand.

TIFTON SANDY LOAM

Virgin areas of Tifton sandy loam have little or no leaf mold on the surface. The surface soil consists of a 4-inch surface layer of brownish-gray loamy sand, underlain by a loose brownish-yellow loamy sand subsurface layer which continues to a depth of about 15 inches. The subsoil is yellow or deep-yellow friable sandy clay, containing iron concretions, which is underlain at a depth of about 48 inches by a mottled pinkish, purplish, and light-gray or whitish imperfectly weathered light sandy clay material. Scattered over the surface and mixed with the surface soil and to less extent with the subsoil are small rounded concretions. In plowed fields the surface soil to plow depth consists of yellowish-gray or light-brown loamy sand. The reddish-brown concretions of the surface soil are much more conspicuous in cultivated than in wooded areas. In places where pebbles are more abundant the surface presents a rather brownish appearance, especially where hard rains have washed away the finer soil material. The concretions in the lower part of the subsoil and near the line of contact between the subsoil and parent material are more yellowish in color and are less perfectly indurated. It is characteristic in Tifton sandy loam for the proportion of pebbles to vary considerably over short horizontal distances. This condition is most prevalent in areas closely associated with the Norfolk soils.

The Tifton soils, locally referred to as "gray pebbly soils," are adequately drained. Tifton sandy loam is extensive in the north-central part of the county and several areas are mapped extending southward into the east-central part.

Tifton sandy loam areas are prevailingly undulating, with sufficient slope to insure good surface drainage. The nature of the subsoil and the presence of a large proportion of pebbles allows ample downward movement of water and excellent aeration. This is considered a good, moisture-retentive soil for this section of the country.

It is estimated that 85 per cent of this land has been cleared and put into cultivation and very little has been abandoned. With the exception of a few small wood lots, the remaining 15 per cent supports young longleaf and slash pines and a little hardwood. Most of the pine-covered areas are boxed for turpentine, which

furnishes considerable income. The original forest growth was longleaf yellow pine, most of which was removed many decades ago.

The physical condition of both surface soil and subsoil is good. This soil has a wider range of crop adaptation than the Greenville soils. Tobacco is rather commonly grown on it in other parts of the State, as at the Coastal Plain Experiment Station at Tifton and in the region farther south. This is probably the best cotton soil of Lee County. Excellent producing pecan orchards of very healthy trees are common. Where well drained this is probably the first of all the sandy loam soils of the county to warm up in spring. This is owing, probably, to the influence of the pebbles on drainage and aeration. All the general field crops return good yields, mainly of cotton, corn, velvetbeans, peanuts, hay, and small grains. Under fair management and in normal seasons the following acre yields are obtained: Cotton, from one-third to one-half bale; corn and beans, 20 bushels of corn and from one-half to 1 ton of beans; peanuts, from one-third to one-half ton of nuts and 1 ton of hay; and oats, 35 bushels. This soil is well suited to the production of the truck crops commonly grown in this section of the country.

This soil responds well to commercial fertilizers. With the exception of occasional applications of soda, only complete fertilizers are used, but the grade and mixture vary widely among farmers and according to the need of the individual crop. Corn receives little or no fertilizer. Oats are sometimes given an application of nitrate of soda in late February or early March, and, rarely, light applications of a complete fertilizer or phosphoric acid alone are applied at seeding time in late October or early November. Cotton probably receives 75 per cent of all the fertilizer used, and from 300 to 400 pounds to the acre of a very high-grade complete fertilizer, analyzing 4–10–4, is considered the most profitable application by many of the more progressive farmers.

Tifton sandy loam, deep phase.—Soil of the deep phase of Tifton sandy loam differs from the typical soil mainly in having a deeper sandy surface soil. The subsoil contains slightly less fine material. It is lighter textured and dominantly lighter yellow in color.

Soil of the deep phase is not very extensive. It occurs almost entirely in the northeastern and north-central parts of the county in close association with other Tifton soils. It occupies a topographic position roughly intermediate between typical Tifton sandy loam and the flat phase.

Cotton is not quite so well suited to this soil as to the typical soil. Tobacco is probably better suited to it. Altogether, the deep phase is somewhat more droughty and slightly less productive than typical Tifton sandy loam.

Tifton sandy loam, flat phase.—The flat phase of Tifton sandy loam differs from the typical soil mainly in that the areas are nearly flat and but little dissected and natural surface drainage is sluggish. The surface soil of the flat phase in wooded areas consists of a 4 or 5 inch layer of brownish-gray loamy sand underlain by brownish-yellow or yellowish loamy sand which continues to a depth of about 15 or 17 inches. The subsoil is yellow friable sandy clay which usually becomes duller yellow with depth and may show streaks and splotches of rust brown in the lower part. In most places the sub-

soil extends to a depth of about 42 inches, where highly mottled whitish-gray, brownish, and reddish imperfectly weathered sandy clay material is present. The pebbles characteristic of the Tifton soils are present throughout this soil as in the typical sandy loam.

This flat soil occurs mainly in the east-central part of the county northwest of Philema, in close association with other Tifton soils, especially Tifton sandy loam, deep phase. A number of small areas with deeper surface soils than typical are included.

The numerous limestone-sink depressions scattered throughout this soil are a conspicuous feature of the landscape. Separation from the typical soil was made on the basis of soil differences incident to the flat surface and sluggish drainage.

The agricultural value of this soil is at present determined almost entirely by artificial and subterranean drainage conditions. Some farms have been successfully drained artificially. All this land can be reclaimed and, by draining, be converted into one of the best agricultural soils of the county with comparatively slight expense. To thoroughly drain all the included limestone-sink depressions, which are composed of Grady soils, would entail considerable expense.

Most of this flat land is under cultivation, and a considerable proportion is devoted to longleaf and slash pines for turpentine production.

ORANGEBURG SANDY LOAM

In virgin areas the surface soil of Orangeburg sandy loam to a depth ranging from 3 to 6 inches, is dark-gray or brownish-gray loamy sand underlain by yellowish loamy sand or light sandy loam which continues to a depth ranging from 12 to 18 inches. The subsoil is bright-red friable crummy and, in many places, rather light-textured sandy clay which extends to a depth ranging from 60 to 72 inches. Below the subsoil is hard but brittle sandy clay material, highly mottled with various proportions of grayish white, yellow, red, and rust brown. Both the depth and character of the parent material change somewhat from place to place. In cultivated fields the surface soil is brownish gray or yellowish gray.

Iron concretions occur in nearly all areas of this soil. These are generally few but in some places are abundant and are indicated on the map by gravel symbols. Where this soil is associated with Greenville sandy loam, especially in rolling areas, spots of the Greenville soil are included. A few small areas of coarse sandy loam texture are also included.

Orangeburg sandy loam is an important soil. Areas are scattered over all the well-drained sections of the county, although more than 85 per cent of this soil occurs in the central and northwestern parts.

Areas range from gently undulating to slightly rolling, the relief of the greater part of the land being rather mild. Generally speaking, those areas mapped in the central part of the county are smoother and those in the northern half more rolling. Drainage is adequate throughout, and erosion is active on the steeper slopes.

Originally Orangeburg sandy loam supported a heavy forest of mixed pine and hardwoods. A large proportion of the timber has

been removed, and the land is devoted to the growing of field crops and pecans. The physical condition of the soil is naturally very good, and chemical analyses show that it is a comparatively fertile upland soil for this section of the country. The soil is easily tilled, and the character of the subsoil renders it retentive of moisture. With fair management and during normal seasons crops may be expected to return such yields as follows: Cotton, one-third bale to the acre; corn and beans, 20 bushels of corn and from one-half to one ton of beans; peanuts, one-third ton of nuts and 1 ton of hay; and oats followed by cowpeas, 35 bushels of grain and 1 ton of cowpea hay. Peach orchards, pecans, and truck crops are grown on this soil in other parts of the State with excellent results. Watermelons do well. The soil is well suited to all the crops grown on the upland soils of Lee County, with the exception of tobacco.

Successful farmers offer the following recommendations for soil management: Prevention of erosion, by means of proper plowing, harrowing, terracing, the growing of vetch or winter field peas as winter cover crops, and the incorporation of more organic matter into the soil; and increasing the nitrogen content by a persistent practice of growing leguminous crops and making liberal applications of barnyard manure and high-grade commercial fertilizers.

ORANGEBURG LOAMY SAND

The surface 2 or 3 inch layer of Orangeburg loamy sand in wooded areas is dark-gray loamy sand. It is underlain by a subsurface layer of yellowish light loamy sand extending to a depth ranging from 16 to 20 inches. Below this is red loamy sand, slightly heavier in texture than the layer above, which continues to a depth ranging in most places from 72 to 96 inches. The parent material is variable, but is everywhere somewhat compact and highly mottled with various proportions of reddish, yellowish, and whitish-gray colors. The texture ranges from loamy sand to sand. The surface soil in cultivated fields is yellowish-gray or slightly brownish-gray sand or light loamy sand. A few areas of this soil mapped in the southeastern part of the county are somewhat coarser textured than typical.

This is a comparatively insignificant soil in Lee County both in extent and agriculturally. Small areas are mapped in nearly all sections of the county where Greenville soils occur, except in the southwest corner. The largest area lies east of Smithville and just south of Fivemile Branch.

Areas are undulating or gently rolling, and drainage is good. The loose consistence of the soil, providing excessive movement of water downward, makes it droughty and of low agricultural value. Under present economic conditions the best use of this soil is probably for forestry.

NORFOLK SANDY LOAM

In virgin areas the surface soil of Norfolk sandy loam consists of a surface layer from 3 to 6 inches thick of dark-gray loose loamy sand, grading into a subsurface layer of grayish-yellow loose loamy sand or light sandy loam, which continues to a depth ranging from 12 to 16 inches. The subsoil of yellow friable sandy clay extending to a depth ranging from 40 to 60 inches grades into mottled or

streaked yellow, brown, red, and gray hard but brittle sandy clay material. Under cultivation the surface soil to a depth of 5 or 7 inches is gray or yellowish-gray loamy sand, the color varying somewhat according to the content of organic matter and the method of soil management practiced. A few iron concretions occur here and there over the surface and scattered throughout the soil.

In the vicinity of and east of Smithville a few areas having rather shallow surface soils and bright-yellow firm heavy sandy clay subsoils, resembling Marlboro sandy loam, are included with Norfolk sandy loam in mapping on account of their small extent.

Norfolk sandy loam has developed to more or less extent throughout all parts of the county. The largest areas are east and southeast of Smithville between Muckaloochee and Muckalee Creeks, just east of Muckalee Creek and south of the mouth of Muckaloochee Creek.

The surface relief differs from place to place. Most areas in the vicinity of Smithville in a belt extending east and southeast for a distance of 5 miles are gently rolling, and most of the other scattered areas are smoother. Drainage conditions differ correspondingly, but all areas have fair surface drainage.

The original forest consisted mainly of long leaf pine, together with a few hardwoods. The original timber has been removed, and about 80 per cent of the land is devoted to farming. A few areas support a cover of young pines, many of which are used in turpentine production.

The content of plant-food materials is slightly lower in this soil than in the Greenville or Orangeburg sandy loams, but the natural physical condition of Norfolk sandy loam equals that of the best soils in the county. This soil is suited to a wider range of crops than any other soil in the county. Yields are similar to those obtained on Orangeburg sandy loam, and, in addition, excellent crops of tobacco are produced. Sirup of a desirable bright color is made from sugarcane grown on this soil.

The most important precaution in soil management is that of taking all practical measures to prevent surface washing. Terracing would help, but the growing of winter cover crops is essential for best results. As this soil is in need of organic matter, it can be built up to a state of high productivity by turning under green-manure crops. All available manure should be properly conserved and distributed.

Liberal quantities of commercial fertilizers are used on this soil, usually with excellent results. From 300 to 400 pounds to the acre are usually applied to cotton, the mixture ranging from a 3–9–3 to a 5–10–5, probably a 4–10–4 mixture being most common. Lighter or no applications are made to corn and usually none to peanuts. Nitrate of soda is sometimes applied to oats at the rate of about 75 pounds to the acre and to corn at a rate of about 50 pounds.

Norfolk sandy loam, deep phase.—The deep phase of Norfolk sandy loam differs from the typical soil mainly in having a deeper surface layer of loamy sand. The yellow friable sandy clay subsoil is reached at a depth ranging from 20 to 30 inches below the surface.

This deep soil is widely distributed in practically all parts of the county, in close association with other members of the Norfolk series. Some of the largest areas are mapped in the vicinity of, east of, and

southeast of Leesburg. In texture, soil of the phase is intermediate between the sandy loam and the loamy sand members of the Norfolk series.

Most of this soil occupies nearly level or gently sloping areas, many of which lie at the foot of slopes adjoining the Grady soils. Drainage is only fair, being slightly inadequate in those places where this soil merges with the Grady soils.

Soil of the deep phase has about the same agricultural value as typical Norfolk sandy loam. It is somewhat more sensitive to seasonal extremes and consequently is less productive. The deep soil is more severely leached of water-soluble elements, owing to the downward movement of a greater amount of water incident to a light surface run-off and to the loose consistence of the surface soil. Therefore, frequent additions of organic matter and heavy applications of complete commercial fertilizers are necessary in order to obtain satisfactory crop yields.

NORFOLK LOAMY SAND

In virgin areas of Norfolk loamy sand the surface layer to a depth ranging from 3 to 5 inches is gray sand. This grades into a subsurface layer of dull-yellowish or grayish sand which continues to a depth ranging from 16 to 20 inches. Beneath this layer is yellow loose open friable loamy sand which continues to a variable depth, in most places from 40 to 60 inches, depending largely on drainage conditions and the character of the underlying material which in most places is light-textured highly mottled whitish-gray, yellowish, and reddish somewhat compact but very brittle and friable material. In cultivated fields the surface soil to plow depth is commonly slightly yellowish-gray or light-gray sand. This soil is intermediate in texture between Norfolk sandy loam, deep phase, and the sands of the Norfolk series.

A few inextensive areas of somewhat coarser texture are included in mapping, as are also a few finer-textured areas which occur in the northeastern part of the county near the Lee-Sumter County line and just east of Kinchafoonee Creek southwest of Smithville. These areas were of insufficient extent to warrant separation. The sand is generally somewhat finer in the northern part of the county.

Areas range in size from a few acres to 2 or 3 square miles and are widely scattered throughout all parts of the county, except the extreme southwestern part.

The surface relief is mild, in many places being only very gently sloping. Drainage is adequate. Even in places where surface drainage is sluggish the loose consistence of the soil allows free downward movement of water.

This soil is very sensitive to extreme seasonal conditions. Its high water-absorbing capacity is detrimental over continued rainy periods, and its loose consistence causes it to be droughty. Nevertheless, under normal seasonal conditions and during rather dry seasons, with proper soil management fair yields of corn, velvetbeans, peanuts, and rye have been obtained. This is an excellent tobacco soil and is extensively devoted to this crop in the tobacco-growing section in the vicinity of Nashville, Ga. Good pecan orchards were

seen on this soil in the southern part of the county north of Albany. Watermelons and sweetpotatoes do well. The soil is not so productive as Norfolk sandy loam but is more productive than Norfolk sand.

Frequent supplies of organic matter, the growing of leguminous crops, and liberal applications of complete high-grade commercial fertilizers are highly recommended by the more successful farmers on this soil.

NORFOLK SAND

In wooded areas of Norfolk sand the surface layer to a depth ranging from 2 to 6 inches is gray sand, in many places somewhat darkened with organic matter. Beneath this is light-yellow or dull-yellow sand which continues to a depth of 36 or more inches. The surface soil in plowed fields is generally gray or light gray in color.

Southeast of Smithville between Muckaloochee and Muckalee Creeks is a large area of this soil, much of which is loose incoherent sand to a depth ranging from 30 to 40 feet, whereas the sand in the greater part of the soil is less than 8 feet deep and much of it not more than 4 feet deep.

A considerable acreage is occupied by this soil, although it is not quite so widely distributed over the county as are the heavier-textured members of the Norfolk series. It is extensive along the eastern county line extending west from the river from 2 to 4 miles. Other large areas are included in a belt south of Smithville.

Areas typically range from undulating to gently rolling. Surface drainage is good and the downward percolation of water is excessive.

The forest growth on this land consists of longleaf and slash pines, together with scattered scrubby hardwoods. The pines are boxed for turpentine. Very little of the Norfolk sand is now under cultivation, although a considerable proportion of it was cleared and put into cultivation before the invasion of the boll weevil and when cheap labor was plentiful.

A few peach orchards are growing on this kind of soil near Macon, Ga., and in some parts of North Carolina dewberries and other small fruits, also vegetables, are successfully grown where the soil is well managed and heavy applications of commercial fertilizers are made. However, this soil is of low fertility and is droughty and unproductive.

Under present conditions in Lee County land of this kind can probably best be devoted to the growing of pine forest unless the efforts now being made to grow tobacco southeast of Smithville prove successful.

NORFOLK COARSE SAND

Norfolk coarse sand is essentially the same as Norfolk sand except that the sand particles are coarser textured and that the coarse sand member contains a higher proportion of fine gravel.

Norfolk coarse sand is inextensive, occurring only in a few large areas in the southeastern and northeastern corners of the county, in such close association with Norfolk sand that the textural gradations from one soil to the other necessitated arbitrary separation in some places.

The openness of the subsoil makes this an extremely droughty soil. It is low in content of water-soluble plant-food materials and is one of the least productive soils of the county. It should be devoted to forestry.

BLAKELY CLAY LOAM

In wooded areas the surface 3 or 4 inch layer of Blakely clay loam is dark reddish-brown loam which grades into reddish-brown clay loam continuous to a depth of about 12 inches. The subsoil is dark-red or maroon-red heavy stiff smooth sandy clay which extends to a depth ranging from 50 to 60 inches. Beneath the subsoil is mottled grayish-white, yellow, reddish, and purplish stiff brittle sandy clay material. In cultivated fields the surface soil to a depth of 5 or 7 inches is dark reddish-brown loam or clay loam, the color varying somewhat according to the kind and amount of organic matter present, and the texture being heavier in many places where the surface layer has been removed by erosion. The color of this soil grades into the color of Greenville clay loam and it was with difficulty that these two soils were separated on the map.

Blakely clay loam is inextensive in Lee County, occurring chiefly in the southwestern quarter. The largest area lies near the mouth of Fowltown Creek and a few smaller areas are mapped on each side of Kinchafoonee Creek south of Hollis Bridge. This soil occurs in close association with the Greenville soils.

The original forest cover, agricultural value of the land, crop adaptation, and problems of soil management are fundamentally the same as on Greenville clay loam. However, the Blakely soil is smoother and therefore less susceptible to destructive erosion. It ordinarily contains a slightly higher proportion of organic matter than the Greenville soil and differs from that soil slightly in physical and chemical characteristics. Because the Blakely soil often fails to scour well from the moldboard of the plow, the local term " push soil " is applied to it.

RUSTON SANDY LOAM

In virgin areas the surface 2 to 4 inch layer of Ruston sandy loam is brownish-gray loamy sand which grades into yellowish loamy sand or light sandy loam continuing to a depth ranging from 12 to 18 inches. The subsoil is reddish-yellow or yellowish-red friable sandy clay which at a depth ranging from 42 to 60 inches is underlain by the parent material of hard brittle light sandy clay mottled with red, yellow, brown, and whitish gray. In cultivated fields the surface soil is yellowish-gray or light brownish-gray loamy sand. Iron concretions in various quantities occur in many places over the surface and through the soil mass. Where numerous, their presence was indicated on the map with gravel symbols. A few small areas coarser in texture than typical were included in mapping in the southeastern part of the county.

Ruston sandy loam is not typically developed in Lee County but is a transitional soil between the gray or yellow soils and the red soils. Consequently, it differs greatly from place to place, especially in the color of its subsoil. Most of the small scattered areas occupy slopes or knolls where surface erosion is active, and this accounts for numerous minor variations in the surface soil, both in depth and color.

This is an inextensive soil. The largest areas are in the vicinity of Leesburg, and small areas are scattered throughout the county except in the northeastern quarter. The relief is strongly undulating or rolling in most places. Drainage is very good and surface erosion is not uncommon.

This soil has no special or peculiar crop adaptations but is devoted to such common field crops as cotton, corn, oats, and peanuts. The yields obtained are comparable to those on the Greenville or Norfolk sandy loams.

This soil would be materially improved by a crop rotation including more leguminous crops, by leaving more organic matter on the fields, and by constructing adequate terraces to prevent erosion.

RUSTON LOAMY SAND

In wooded areas Ruston loamy sand has a surface layer from 2 to 4 inches thick of dark brownish-gray sand. This is underlain by brownish-yellow sand which extends to a depth ranging from 10 to 18 inches. Beneath this layer is a subsoil of reddish-brown loose loamy sand which continues to a depth ranging from 40 to 60 inches, at which depth it is underlain by hard brittle sandy material highly mottled with whitish, yellowish, and reddish colors. Under cultivation the surface sand loses the dark tinge as a result of the loss of organic matter.

Included with mapped areas of Ruston loamy sand are a few areas which are underlain at a depth of 36 or more inches by friable sandy clay. Several areas coarser in texture than typical are in the southeastern part of the county, extending up Flint River as far north as Philema.

Ruston loamy sand is rather extensive in Lee County. Areas ranging in size from a few to several hundred acres are scattered throughout the county, mainly along the larger stream swamps in slope positions between the loamy sand members of the Greenville and Orangeburg series and swamp areas. Other areas occupy positions farther from the streams between the red loamy sand soils and the Norfolk soils.

Soil of this kind occurs on swamp-border slopes and in nearly flat, plainlike areas. Surface drainage is good, as the open subsoil allows free percolation of water.

Most of the land had been cleared and devoted to the production of general field crops before the advent of the boll weevil, but much of it has since been abandoned. Yields are generally rather low.

Most of the Ruston loamy sand should be devoted to forestry, especially the coarser-textured areas. When cultivation is attempted the best soil management should be practiced, such as crop rotation, making liberal applications of barnyard manure and commercial fertilizers, supplying organic matter, and growing leguminous crops where practical.

GRADY SANDY LOAM

To a depth ranging from 4 to 6 inches Grady sandy loam is dark-gray sandy loam, usually high in organic matter. The subsurface layer is grayish-yellow sandy loam, in most places mottled with yellow and rust brown, which extends to a depth of about 15

inches. The subsoil, which is heavy and compact in places, is highly mottled whitish-gray and yellowish heavy sandy clay or clay containing splotches or streaks of brown and red.

Areas of Grady sandy loam occurring near the Tifton soils contain soft iron concretions. Two very small areas in the northeastern part of the county having a mucky covering ranging from a few inches to 2 feet in depth were included in mapping.

This is the most extensive soil in Lee County. It occurs in large and small areas of irregular and various outlines, widely scattered throughout the county except along Flint River where the Plummer soils occur.

Grady sandy loam occupies saucerlike depressions and broad flat areas and narrow sloughs lying lower than the surrounding soils. Such depressions serve as collecting basins or natural drainage ways for the adjacent slope run-off. A few of these depressions contain water the greater part of the year or during the winter months; some have ready subterranean drainage or pervious substrata affording free downward movement of the surface water. The land is poorly drained throughout.

A mixture of water-loving pines and oaks constitutes the predominant tree growth, and wild grasses of various kinds furnish the principal ground cover.

Under present drainage conditions this is not an agricultural soil, but the greater part of the land could be drained at a very reasonable expenditure. If properly drained the soil would return satisfactory yields of grains, hays, roughage, and pasture grasses. It is recognized that most of this soil, even under natural drainage conditions, will produce good pasturage if seeded to carpet grass, Lespedeza, and Dallis grass. A pasture of this description has been grazed for several years at the Chehaw station on the Georgia Southwestern & Gulf Railroad, showing a carrying capacity of more than two animals to the acre for a period ranging from 9 to 12 months of the year, depending on the severity of the winter. Carpet grass predominated in the mixture sown. Bermuda grass also thrives on this soil. Land of this kind is highly recommended for pasture.

GRADY CLAY LOAM

Grady clay loam resembles Grady sandy loam, differing principally in texture. The surface soil of the clay loam to a depth ranging from 3 to 5 inches is dark-gray or bluish-gray very heavy sandy loam or loam underlain by grayish, in some places mottled, clay loam which continues to a depth ranging from 8 to 19 inches. Beneath this layer is heavier-textured highly mottled grayish, yellowish, and rust-brown tough and sticky sandy clay or clay.

As Grady clay loam is very closely associated with Grady sandy loam separations on the map are in many places arbitrary, small areas of one soil being included with the other. In the heavier parts of the soil material, especially at considerable depths, the proportion of the many-colored mottles varies. In some places the borders of the areas have deeper light-textured surface soils.

Grady clay loam occupies a few of the larger depressions in the southeastern quarter of the county but occurs principally in the

west-central and northwestern parts. It occupies positions similar to or slightly lower than Grady sandy loam. Drainage conditions are correspondingly poorer.

Practically none of this land is under cultivation. It supports a forest growth consisting largely of cypress and gum. It is best adapted to forest or pasture, depending largely on drainage conditions.

PLUMMER SAND

The 4 to 6 inch surface layer of Plummer sand is gray sand. It is underlain by a subsurface layer of whitish-gray sand which continues to a depth ranging from 12 to 36 inches, where it grades into grayish-white or light-gray water-logged sand containing various quantities of yellowish or brownish streaks, splotches, or mottles.

Plummer sand occurs only in the belt of sandy soils along Flint River. A few rather large areas are in the northeastern part of the county but all other areas are small.

Areas of Plummer sand are flat and drainage is naturally poor. Pasture grasses may be grown with some degree of success under natural drainage conditions, but this soil, unless artificially drained, is best suited to the growing of longleaf and slash pines for lumber and turpentine. Under present economic conditions, it is probably not advisable to attempt artificial drainage.

KALMIA LOAMY FINE SAND

Kalmia loamy fine sand has a surface layer from 3 to 6 inches thick of grayish-yellow or grayish fine sand. This is underlain to a depth ranging from 12 to 18 inches by yellowish fine sand, beneath which is yellow friable loamy fine sand usually mottled with gray at a depth of a little more than 3 feet.

Included with mapped areas of this soil are a few small areas of fine sand and a few spots which are underlain by fine sandy clay. Along Muckalee Creek near the southern county line the soil is considerably coarser textured than typical.

Areas of this soil are mapped along the second bottoms or terraces of all the larger streams of the county, the largest being along Kinchafoonee Creek in the southwestern quarter.

Areas of Kalmia loamy fine sand are nearly flat, undulating, or in places somewhat billowy. A more or less perfect natural levee in the shape of a low ridge borders part of the west bank of Flint River. Drainage is fair, although parts of the land are flooded during extremely high-water periods.

From 20 to 30 per cent of the land is under cultivation, and the remainder is forested. General field crops, peanuts, and some watermelons and pecans are grown. Yields fluctuate widely with seasonal conditions.

CAHABA FINE SANDY LOAM

The 2 to 4 inch surface layer of Cahaba fine sandy loam is grayish fine sand. It is underlain by light brownish-yellow fine sandy loam, which continues to a depth ranging from 12 to 15 inches. The subsoil is yellowish-brown heavy loamy fine sandy clay, which at a

depth of about 3 feet grades into reddish-yellow loamy fine sand. A few small included areas are medium sandy loam in texture.

This soil is closely associated with Kalmia loamy fine sand, but is much less extensive. The largest areas lie along Kinchafoonee Creek west and southwest of Leesburg, and smaller areas are scattered along most of the large streams.

Areas are flat or undulating and drainage is good, although occasional overflows occur. The subsoil is retentive of moisture.

Probably more than half this soil is or has been cultivated to the various feed and food crops, including peanuts and pecans. Fair returns are obtained.

AMITE FINE SANDY LOAM

Amite fine sandy loam is characterized by a surface layer from 5 to 8 inches thick of brown or reddish fine sandy loam. It is underlain by a subsurface layer of reddish-brown heavy fine sandy loam which extends to a depth of about 12 or 14 inches. The subsoil of red fine sandy clay or medium sandy clay continues in most places to a depth of more than 4 feet.

This is the least extensive terrace soil in the county. It occurs only in a few areas along Flint River in the vicinity of Philema.

Areas are gently undulating and drainage is adequate. The soil is retentive of moisture and is productive. The physical condition is excellent and the land is in a good state of cultivation. It is suited to a great variety of crops and returns excellent yields of all field crops common to this section of the country. Such special crops as peaches, pecans, and many truck crops do well on it.

CONGAREE SILTY CLAY LOAM

The surface soil of Congaree silty clay loam consists of a layer of brown silty clay loam from 6 to 10 inches thick. In places a thin surface covering, about one-half inch thick, of dark grayish-brown silty clay loam carrying a large amount of organic matter occurs. The subsoil to a depth ranging from 30 to 40 inches is yellowish-brown or light-brown silty clay loam, which breaks into irregular-shaped lumps and finally crumbles to a fine mass. Both surface soil and subsoil are micaceous and when wet become sticky and slick.

Many small areas occupying sloughs and depressions are underlain at a depth of 10 or 12 inches by grayish-yellow or brownish-yellow silty clay, mottled or speckled with rust brown. In some areas of this soil lying nearest the river the texture approaches fine sandy loam.

This is the only first-bottom soil mapped in Lee County. It is inextensive, occurring only in the first bottoms on the west side of Flint River in the northeastern part of the county.

Areas are flat or nearly flat and are not well drained. The land is subject to frequent overflow by the river and in times of extremely high water it is covered to a depth of many feet.

A luxuriant forest, consisting principally of water-loving oaks, hickory, swamp maple, gum, and other hardwoods, together with a few pine, occupies probably 90 per cent of the land. This is naturally a very fertile soil, and if protected from overflow it would

be one of the most productive in the county. A small acreage is devoted to corn, small grains, and hay, and high yields are obtained when floods are not destructive. On account of its susceptibility to overflow, it is best to allow this soil to remain in forest and pasture.

CUTHBERT SANDY LOAM

The 3 to 6 inch surface layer of Cuthbert sandy loam consists of gray loamy sand. This is underlain by yellowish loamy sand which extends to a depth ranging from 10 to 14 inches. The subsoil is usually yellowish or brownish-yellow tough impervious sandy clay, becoming mottled with gray, brown, and red at a depth ranging from 30 to 40 inches. Many cultivated fields appear whitish gray on the surface.

A few small areas of this soil are scattered throughout the southern and western parts of the county. Their aggregate area is less than one-half square mile.

The relief is undulating or gently rolling. Surface drainage is good, but the downward movement of water is seriously retarded by the impervious subsoil.

Yields on this soil are low. The land should be devoted to forest.

SWAMP

Swamp includes first-bottom lands which remain saturated or covered by water much of the year. Hence no type description could be given them.

Small islandlike areas of low terrace soils are scattered throughout the wider swamps but were not separated as they were considered of insufficient importance to justify the necessary work and time. The larger areas were separated and identified as Kalmia loamy fine sand.

Swamp includes only the depressed areas along running streams. The poorly-drained limestone sinks and depressed drainageways are occupied by the Grady and Plummer soils.

Swamp is mapped rather extensively along the larger creeks of the county and to less extent in the flood plain along Flint River. The width of swamp areas differs considerably. None of this material is mapped along much of Kinchafoonee and Muckalee Creeks near the southern county line. Farther north the width of the swamp land along Muckalee Creek is as much as a mile in a few places. Rather large strips of swamp occur along Chokee, Muckaloochee, Hilokee, Fowltown, Chokeelagee, and Fox Creeks and a number of other streams throughout the county.

A heavy forest cover, consisting mainly of oaks, hickory, beech, maple, sycamore, magnolia, gum, bay, and some ash, cypress, and poplar with varying quantities of pine, is now growing on the swampy areas. Some of the swamp land is grazed by hogs.

By straightening and dredging out the stream beds the streams would have ample fall for drainage of the swamps. Under prevailing economic conditions such an attempt would probably be unwise, as excellent well-drained soils in the county may be purchased at low prices. Lowering of the water table might seriously affect the

growth and development of the present timber cover. Drainage of the swamps would materially improve sanitary conditions. The best use of this land is for timberland and hog pasture.

SUMMARY

Lee County is in the southwestern part of Georgia. It embraces an area of 358 square miles, or 229,120 acres.

The surface relief is characterized by undulating or gently rolling uplands marked by numerous irregularly distributed limestone-sink depressions and low plains along the larger streams. The range in elevation is from slightly less than 225 to more than 340 feet. Several rather large streams, including Flint River, border or cross the county.

According to the 1920 census, the population of the county was 10,904, all of which was classed as rural. The average density was 33.4 persons to the square mile. Leesburg and Smithville are the largest towns.

The county is well served by four railroads, two national highways, and good county roads. Rural mail routes reach all communities.

The summers are long and the winters are mild. The frost-free season averages about eight months.

Cotton, corn, and peanuts are the principal cultivated field crops, and oats and leguminous hays are also important. Watermelons, peaches, and tobacco are the principal special crops. Pecan culture and hog raising are increasing in popularity.

The soils of Lee County differ widely in many characteristics, ranging in texture from clay loams and silty clay loams to coarse quartz sands carrying a large amount of fine gravel; in color from whitish gray to very dark gray and dark red; in consistence from incoherent to impervious; and in relief and drainage from flat and swampy to rolling and eroded. There is a correspondingly wide range in the productivity of the soils. The presence of iron concretions or accretions is rather common in all the well-drained upland soils, especially the medium or heavy textured soils. Probably 25 per cent of the land in the county, including limestone-sink depressions and stream swamps, is poorly drained. Practically all this land could be reclaimed. It is estimated that about 8 or 10 per cent of the soils consists of deep sand and is droughty and low in fertility. From 65 to 70 per cent has adequate natural drainage, retentive subsoils, and is comparatively fertile and productive. Though few of the soils are very strongly acid, all the agricultural soils are acid in reaction and are generally somewhat deficient in available phosphoric acid, potash, and nitrogen, and low in humus.

The Greenville, Orangeburg, Tifton, Norfolk, Blakely, and Ruston soils are well adapted to the general farm crops, pecans, and many truck crops. Peaches are grown mainly on the Greenville and Orangeburg soils and tobacco on the gray or yellow soils.

Terrace or second-bottom lands, represented by Kalmia loamy fine sand and the fine sandy loam members of the Cahaba and Amite series, are not extensive.

The present condition of the principal agricultural soils of the county calls for good management. All practical steps tending to check the rate of erosion should be resorted to. Deeper plowing on the "level," adequate terracing where needed, the growing of winter cover crops, a proper system of crop rotation including as many leguminous manure crops as practical, and at least occasional light applications of barnyard manure, together with the necessary commercial fertilizers, are among the items of soil management advocated by the most successful farmers.

[PUBLIC RESOLUTION—No. 9]

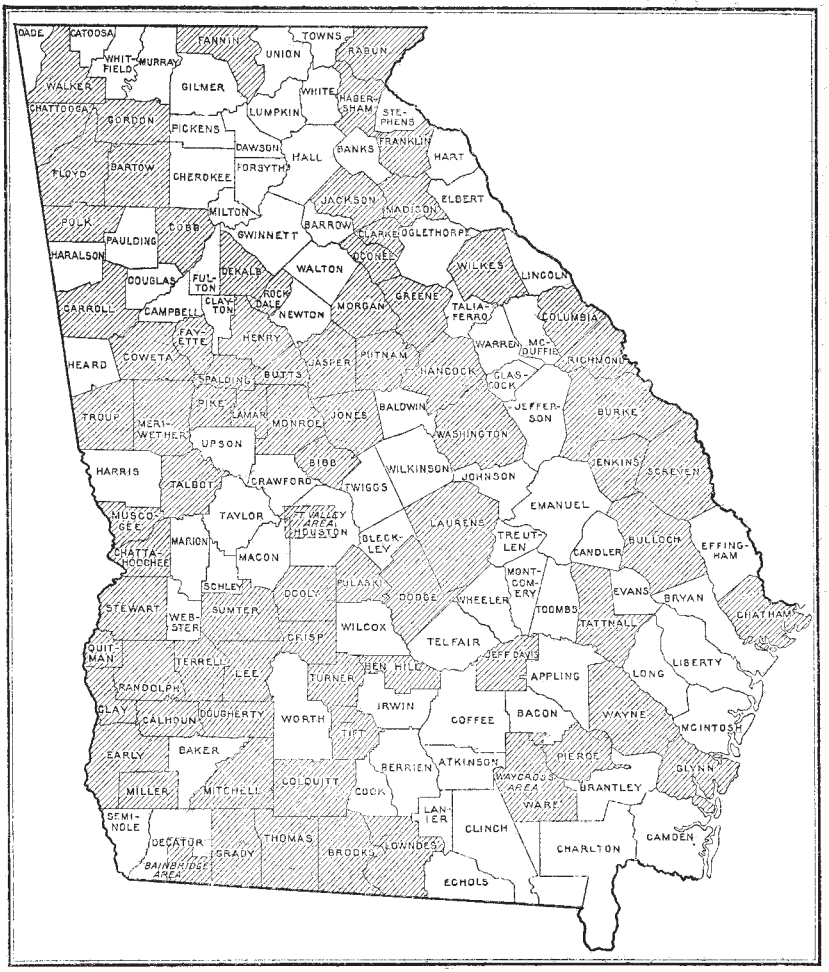
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture"

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Georgia, shown by shading

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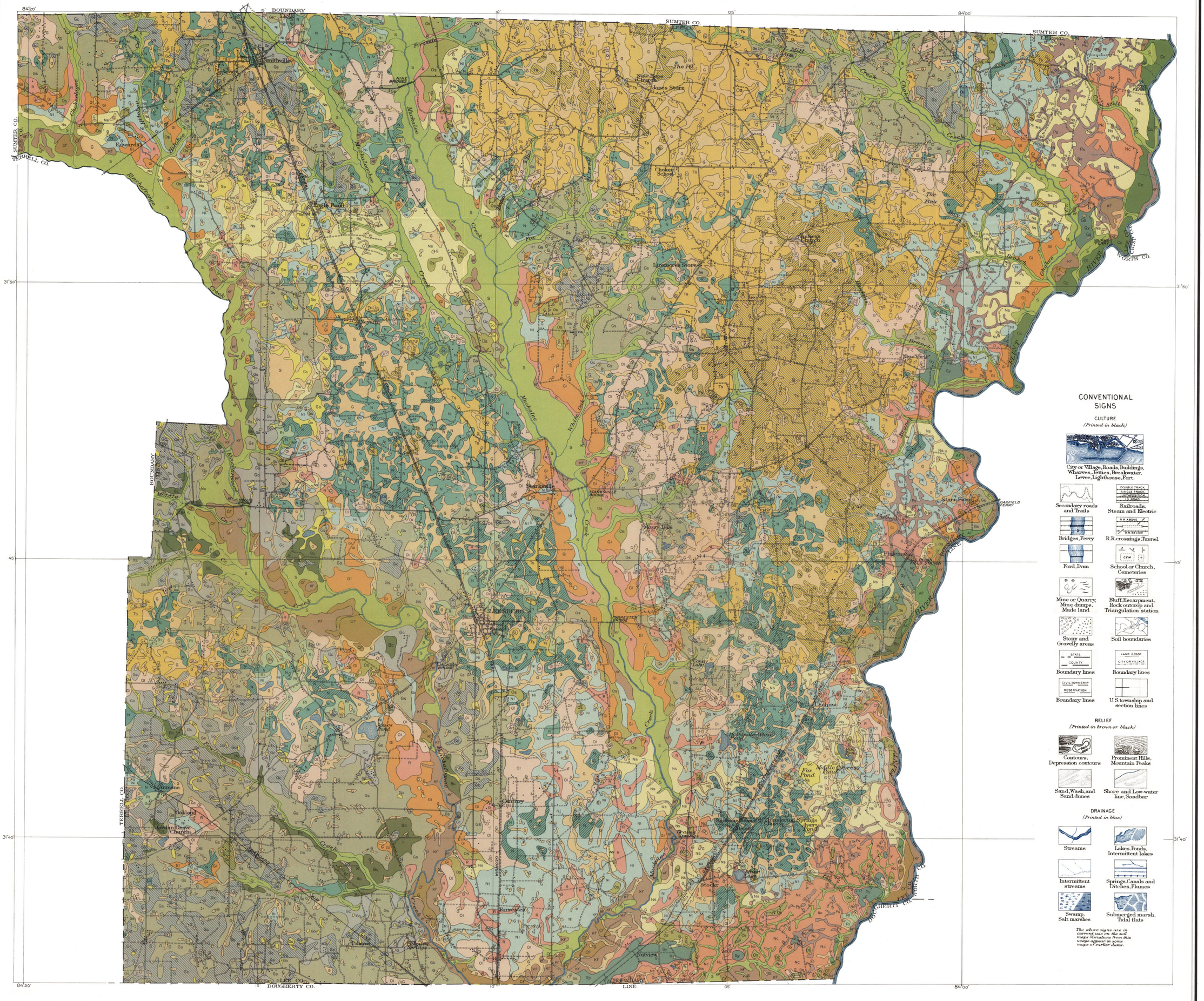
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
A. G. McCALL, CHIEF, SOIL INVESTIGATIONS
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP

LEE COUNTY
GEORGIA

GEORGIA STATE COLLEGE OF AGRICULTURE
ANDREW M. SOULE, PRESIDENT
L. M. CARTER, HEAD, DIVISION OF AGRICULTURAL CHEMISTRY



LEGEND

Amite fine sandy loam — Af	Norfolk coarse sand — Nc
Blakely clay loam — Bc	Norfolk sand — Ns
Cahaba fine sandy loam — Cf	Norfolk loamy sand — Nl
Congaree silty clay loam — Cc	Norfolk sandy loam — N
Cuthbert sandy loam — Cs	N — Deep phase
Grady sandy loam — G	Orangeburg loamy sand — Os
Grady clay loam — Go	Orangeburg sandy loam — Ol
Greenville loamy coarse sand — Gy	Plummer sand — Ps
Greenville loamy sand — Gl	Ruston loamy sand — R
Greenville sandy loam — Gs	Ruston sandy loam — Rl
Greenville clay loam — Gc	Tifton sandy loam — Ts
Gc — Pebbly phase	Ts — Deep phase
Kalmia loamy fine sand — Kf	Ts — Flat phase
	Swamp — S

W. Edward Hearn, Inspector, District 2
Soils surveyed by J. W. Moon

Scale 1 inch=1 mile
1 0 1 2 3 4 Miles

A. Hoen & Co., Inc. Lith.

Field Operations
Bureau of Chemistry and Soils
1927